

**Summary Minutes of the
U. S. Environmental Protection Agency
Science Advisory Board (SAB)
Ecological Processes and Effects Committee (EPEC)
Public Meeting
October 2, 2003, Marriott Key Bridge Hotel, Arlington, VA**

Subcommittee Members: (See Roster – Attachment A)

Date and Time: 8:30 a.m. – 5:30 p.m., October 2, 2003 (See *Federal Register* Notice - Attachment B)

Location: Marriott Key Bridge Hotel
1401 Lee Highway
Arlington, VA 22209

Purpose: The purpose of this meeting was to conduct a consultation on EPA's strategy for developing water-quality criteria for suspended and bedded sediments and to discuss EPEC activities for fiscal year 2004.

Attendees:

Chair:	Dr. Virginia Dale
Panel Members:	Dr. Gregory Biddinger Dr. Ivan Fernandez Dr. Cynthia Gilmour Dr. Charles Hawkins Dr. Lawrence Master Dr. Judy Meyer Dr. Michael Newman Dr. Charles Pittinger
Consultants:	Dr. Brian Bledsoe Mr. Charles Rabeni Mr. Timothy Thompson
SAB Staff:	Dr. L. Joseph Bachman, DFO Dr. Vanessa Vu, SAB Staff Office

Other Participants (In Order of Appearance on Agenda):

Mr. William Swietlik, OW
Dr. Walter Berry, ORD
Dr. Phil Kaufmann, ORD
Dr. John Paul, ORD

Mr. Douglas Norton, OW
Dr. Edward Bender, ORD
Ms. Dale Matey, OSWER
Dr. Susan Norton, ORD
Dr. Michael Slimak, ORD
Dr. Glenn Suter, ORD
Dr. Randall Wentsel, ORD
Dr. Peter Grevatt, OW

Other Attendees:

Ms. Natalie Baughman, Water Policy Report
Ms. Susan Cournier, ORD
Ms. Kathryn Gallagher, EPA
Mario Ganboh, ACC
Mr. Tom Gardner, EPA
Ms. Laura Garanski, EPA
Mr. Ben Jessup, Tetra Tech
Mitra Jha, Region 8
Ms. Ann Russo, OW
Mr. Bob Spehar, ORD
Mr. Chris Zabawa, OW

Meeting Summary

The discussion generally followed the issues and as presented in the Meeting Agenda, with some modifications (See Meeting Agenda - Attachment C). The meeting lasted until 5:30 p.m. on October 2, 2004. No public comments were submitted to the subcommittee.

Opening of Subcommittee Meeting

Dr. Joseph Bachman, Designated Federal Officer (DFO) for EPEC, opened the meeting at 8:30 a.m. and welcomed meeting attendees. He began with a brief review of the agenda, noting that a consultation meeting would take place during the morning session followed by discussions of fiscal year (FY) 2004 activities in the afternoon. He stated that the EPEC is an expert panel whose meetings are public by law. He reviewed FACA requirements, the subcommittee's compliance with Federal ethics and conflict-of-interest laws, and the subcommittee formation process (selection procedures and biographies of subcommittee members are available on the SAB website). Dr. Bachman said that his role as DFO was to be present during subcommittee business and deliberations. Records of subcommittee discussions are maintained and summary minutes of the meeting will be

prepared and certified by the subcommittee chair, and will be available to the public in approximately one month, he said. No members of the public asked to comment, but Dr. Bachman asked anyone wanting to address the subcommittee to see him at the conclusion of his remarks, and he would schedule a time for them to present their comments. [No members of the public did so, and so no public comments were offered.] He also asked subcommittee members to comment for the public record if the discussions touched on their personal research or some other point that might lead to a conclusion that a lack of impartiality exists. He noted that the SAB ethics officer concluded that no conflict of interest exists in the consultative panel. Dr. Bachman thanked the subcommittee members for their participation.

Welcome

Dr. Vanessa Vu, SAB Staff Office Director, welcomed EPEC members, the audience, and Agency officials to the meeting. She thanked EPEC members for their time, effort, commitment, and support during the consultation on such an important topic. Dr. Vu also thanked EPA staff from the Office of Water (OW) and Dr. Bachman for their work on behalf of the subcommittee. She stated that during the afternoon session she would provide EPEC with an overview of the project requests from the Agency for FY 2004 and an update on the status of the SAB reorganization.

Opening Remarks

Dr. Virginia Dale, Subcommittee Chair, expressed appreciation to Dr. Vu, Dr. Bachman, and Agency staff for their insight and hard work in preparing for the EPEC meeting. Members of EPEC introduced themselves and noted their areas of expertise. Dr. Dale commented on the diversity of experience and expert qualifications of the subcommittee members.

Consultation on Water-Quality Criteria for Suspended and Bedded Sediments (SABS)

Dr. Dale turned to the Agency staff for their presentations, and asked subcommittee members to hold their questions until after the initial presentations.

Introduction/Overview:

Mr. William Swietlik, Office of Science and Technology (OST)/OW, stated that a team of EPA research scientists had been working on the issue of developing water quality criteria for SABS. He noted that he and other staff members were present to set the stage for the discussion of the written consultation document (See “Developing Water Quality Criteria for SABS: Potential Approaches” – Attachment D). Mr. Swietlik commented that copies of the written consultation document and the staff slide presentations (See

“Developing Water Quality Criteria for SABS”-- Attachment E) are available to members of the public. SABS will be referred to as sediments during presentation, he said.

Mr. Swietlik provided an overview of the potential approaches to developing criteria for SABS outlined in the draft consultation document, summarized by slides. The EPA is looking at eight potential approaches or tools for this: toxicological, relative bed stability, conditional probability, state-by-state reference condition, fluvial geomorphic, water body functional, new criteria efforts, and synthesis/combination. Staff experts will be talking about first five approaches and the last three as described in the draft are self-explanatory, he said. Mr. Swietlik expressed gratitude to EPEC for its input at this early stage of the process.

In discussing the purpose and background of the issue, Mr. Swietlik said that sediment imbalances constitute one of the top five problems of water quality in all water types. Many different criteria approaches are used by the states and are described in the consultation document; some may be effective but others may not. The Agency has heard directly from states that new and improved criteria for sediments are needed.

Mr. Swietlik described the three-fold charge of the OW: first, seeking advice and recommendations on the best potential approaches to developing water quality criteria for suspended and bedded sediments; second, seeking recommendations on additional criteria development approaches for different types of water body uses, other than aquatic life; and third, seeking advice on any other scientifically defensible criteria derivation methodology not included in the consultation paper.

Noting that 10 specific questions are included on page 49 of the consultation paper, Mr. Swietlik asked the subcommittee to focus most particularly on 4 questions: question 1, related to the validity of establishing a natural level; question 2, which asks how far the EPA should go in breaking down its classifications by water body types; question 6, determining which of the proposed methods might work well; and question 7, whether or not several approaches can be synthesized into one.

Mr. Swietlik stated that the Agency hopes to move forward to an implementation strategy akin to the nutrient strategy and biological criteria strategy currently in use. The expectation is that there would be an implementation phase of several years where EPA provides assistance to the states and tribes. He questioned whether it is possible to develop a “one size fits all” approach that all states could use, as is the case for chemical and toxic criteria.

Mr. Swietlik reviewed existing criteria beginning with that established by EPA 1976, which is not used much any more. Most states use numeric, narrative criteria consisting

primarily of turbidity measures. The appendixes in the consultation document list the details, he said.

In conclusion, Mr. Swietlik introduced staff experts to provide an overview of the newer tools or approaches EPA is examining, including some efforts used in other countries, that are described in detail in the consultation document. He thanked subcommittee members for their advice and support.

Toxicological Dose-Response Approach:

Dr. Walter Berry, Office of Research and Development (ORD), provided an overview of the proposed toxicological approach, aided by slides. He described the approach as much more directly cause and effect than some of the others, in which a conceptual model outlining the ecological processes affected by SABS is developed for a particular class of water body. Numerical targets are established for protecting chosen ecological processes, species, and designated uses.

Dr. Berry provided a conceptual model of biological effects that illustrated the primary sources of sediment supply with a focus on both direct effects such as smothering and shading and the indirect effects on the habitat. He noted that SABS affect many links in the food chain.

Additional available models often relate to fish, including total suspended sediment, turbidity (primarily on feeding), and pebble count/embeddedness (primarily salmon spawning). The Chesapeake Bay Water Clarity model focuses on submerged aquatic vegetation. Dr. Berry stated that light transmission is a criterion used by many states. Application of the Chesapeake Bay Criteria is appealing because secchi depth is something that is easily measured and readily interpretable.

Dr. Berry pointed out some advantages and disadvantages of the toxicological approach. Advantages include that the approach is easy to understand and explain and indicates a direct cause and effect relationship. Thus, in establishing a total maximum daily load (TMDL), it is useful to tell those spending millions of dollars that reducing turbidity can increase salmon feeding, he said. However, the approach is very data intensive and the effects are site, species, and life-stage specific as well as concentration, duration, and seasonally dependent. Monitoring is difficult because the states cannot just make one measurement and be done.

Dr. Berry concluded by noting that some useful models for biological SABS exist, and it is possible to develop scientifically defensible SABS criteria using the traditional dose-response approach that can incorporate some habitat-specificity (e.g. Chesapeake Bay,

mountain stream, lower river). The toxicological approach can be very useful in tandem with other approaches, he said.

Relative Bed Stability Approach:

Dr. Phil Kaufmann (ORD) described the relative bed stability approach (RBS) as a practical program that does not require months or years to implement. Using slides, he illustrated ways to scale the effects of changes in streambed fine sediment on biota. A means to factor out natural variability is needed to determine the amount of fine sediment impact that is attributable to human activities. Sediment size is dependent on landscape context, he said.

Dr. Kaufmann explained the controls on bedded sediments. Landscape controls such as geology, climate, vegetation, and natural disturbance drive the sediment supply. The RBS approach looks at bed sediment size as the interplay between sediment supply and transport.

Quantifying the substrate and scaling it for natural controls involves taking the mean particle size and comparing it to the diameter that the stream can move, which is dependent on the size of stream and is lessened by large channel roughness (woody debris). RBS is an inverse measure of excess sedimentation, he said.

Dr. Kaufman said that streams tend to adjust transport capability to match the sediment coming in; therefore streams minimally disturbed by humans should tend towards the size that the stream is capable of moving as bedload.

Dr. Kauffman provided examples of relative bed substrate stability using graphs relating to RBS and Environmental Mapping and Assessment (EMAP) locations in OR and WA and RBS to human disturbance in EMAP-West. In the EMAP-West example, the model was tested by applying it to data from the first few years. In the least disturbed streams, the relation was roughly one to one. Other graphs provided examples of biota and RBS and of how RBS has been used to evaluate the condition of streams.

Dr. Kauffman summarized that the sedimentation index (inverse of RBS) appears to be biologically relevant and he said that the RBS approach is practical for ambient monitoring programs. The numbers used all came from EMAP and he estimated that it took 2 people about 1-½ hours to do the research.

Conditional Probability Approach:

Dr. John Paul (ORD) described the use of conditional probability as a general approach in which a threshold value not to be exceeded is specified to protect against biological

impact. Use of conditional probability to express threshold of impact is a logical way to support development of numeric water quality criteria. Conditional probability is defined as the probability of something occurring when it is known that something else has occurred.

Dr. Paul explained the assumptions used in the model and the two-step approach that ends with an empirical curve as well as the possible approaches for identifying thresholds of impact. Data can be post-stratified by various classification methods. He provided an example via slides based on 100 Mid-Atlantic EMAP stream segments accompanied by several graphs. The example illustrated that the model works for a selection of SABS indicators that are strong stressors for streams in the Mid-Atlantic. He suggested that the conditional probability approach needs to be evaluated in other geographic areas and with other resources.

Reference Condition Approach:

Mr. Swietlik described the basic steps in the state-by-state reference condition approach as determining SABS indicators to be measured, selecting reference sites that are minimally disturbed, monitoring at reference sites, classifying the sites, characterizing the reference condition for the classes, and setting thresholds. Using slides, he provided examples of criteria for selecting reference sites. The Agency does not recommend that these criteria be developed by all states.

Classification is the key step in this approach, he said. Discrete classification approaches can also relate to aquatic life. In discrete classification, water body types are broken into different classes. Mr. Swietlik provided graphs that illustrated setting criteria for discrete classes. Different percentiles can be chosen depending on criterion.

Mr. Swietlik characterized the biggest question of the state-by-state reference condition approach as one of classification difficulties; that is, how far down to classify to achieve homogeneity of waterbody type and sediment regime.

Fluvial Geomorphic Approach:

Mr. Douglas Norton, Office of Wetlands, Oceans and Watersheds (OWOW)/OW, explained that the fluvial geomorphic approach differs from the other approaches primarily because there is not a specific data set. The approach is one of revisiting concepts that offers important perspectives to consider. The fluvial geomorphic approach considers the interrelationship of sediment supply, channel form, hill slope and within-channel sources, erosional and depositional processes, and channel stability through time rather than at one specific point in time. Channel form is used as opposed to specific characteristics previously identified in other approaches, he said

Fluvial geomorphology uses a continuum of different channel metrics, and the field does not expect closely defined parameters but rather a wider range. Mr. Norton said that another difference from other approaches is that fluvial geomorphology is closer to the “cause” end; e.g. the sources of stressors and therefore is closer to the TMDLs. Channel evolution offers a look at where channels are and where they will go over time.

Mr. Norton described the EPA-funded developmental work by David Rosgen on a sediment assessment framework, called Watershed Assessment for River Stability and Sediment Supply (WARSSS). Parallel pathways are used in screening unstable watersheds. Sediment load is quantified and predicted after screening, which involves an enormous amount of data, he said. Multiple pathways hyperlink to other data sets. Mr. Norton noted that most of the work is done in the Rocky Mountain States.

Mr. Norton provided illustrations of the observed channel evolution sequences and the classification of channel types in WARSSS via slides. The Rosgen classification system is a cross-sectional configuration that considers particle size distribution as well as other factors. Channel evolution has shown a re-establishment of equilibrium with the sediment load.

Another element of WARSSS is the use of Sediment Rating Curves (SRCs), which is an effort to establish the relationship of SABS against flow. Mr. Norton stated that this aspect is in the exploratory state and it is unknown how strong of a relationship can be found, but it is not statistically significant yet. He referenced a study by Troendl et al. (2001) that stratified by Rosgen stream type.

Mr. Norton concluded with some possible outcomes of considering geomorphic approaches, including use in narrative criteria input stratifying by type (which many states have done by biota) and in numeric criteria input channel typing parameters (especially RBS). Some states have expressed much interest in stability ratings.

A break was taken at 9:50 a.m. Discussion resumed at 10:05 a.m.

Panel Discussion

Dr. Dale thanked Mr. Swietlik and the EPA’s team of experts for their presentations that summarized the complex issues in a timely fashion. She requested that subcommittee members to ask questions of the team and then to focus their comments on the four priority questions enumerated by Mr. Swietlik.

A subcommittee member asked whether any of the approaches would be applicable to all types of ecosystems, given their focus, as presented, was on streams. Furthermore, most

of the presentations dealt with salmonid streams or fast flowing streams in the east. Thus, it would not appear that any of the approaches are applicable to the highly regulated rivers in the mid-west, wetlands, lakes, reservoirs, estuaries, or oceans. Mr. Swietlik responded that the reference condition approach could apply to other water bodies. Dr. Kaufmann noted that the RBS approach is applicable to rivers, but there is a problem in that it takes more time to gather the information. Further, the approach is not really suitable for lakes or estuaries but there is room for using it in ocean water.

A subcommittee member commented that the presentations reflected only the problem of too much sediment and did not examine issues of too little sediment, and he asked about opportunities to look the implications of RBS ratios higher than one. Other members echoed this concern. Dr. Kaufmann stated that he did not present the finer details of the RBS approach because of the time constraints, and he said that the issue of too little sediment is visible in the data set. Particularly in higher developed areas in the mid-Atlantic region where there are extensive impervious areas (e.g. paving) and transport capacity is high because of increased runoff (hydrologic alteration) sediment starvation may occur (deficits in fine sediments). The subcommittee member expressed concern with how the approach would be applied, making special mention of streams flowing on bedrock. Dr. Kaufmann responded that where exposed bedrock occurred in Pacific Coastal Range stream channels, the RBS would indicate a high degree of stability. When plotted against EPT insect taxa (i.e., orders *Ephemeroptera*, *Plecoptera* and *Trichoptera*), or against the Index of Biotic Integrity, it is evident that very high RBS values (>1.0) that occur with abundant channel bedrock have low habitat value. Bedrock tends to max out at 60-80 percent and tends to dominate the picture like sediments. Dr. Paul said that the conditional probability approach is applicable to estuaries.

A subcommittee member stated that the clear uncertainties in these approaches must be expressed and he recommended that explicit statements of uncertainty be contained in written documents. Mr. Swietlik agreed from a programmatic standpoint and he said that states often try to factor in uncertainties on an ad hoc basis, which leads to inconsistency in the program. Dr. Kauffman noted that EMAP has invested a lot of effort in quantifying the uncertainties in measuring sediment, RBS, and other physical and biological attributes of surface waters.

Another subcommittee member repeated the observation that, with the exception of the Chesapeake Bay, most of the analyses focused on streams. The draft document does not actually address highly regulated rivers such as those in the mid-west and systems that EPA has said are the key problem, and he questioned how these approaches would be effective in rivers that are clearly impacted. Further, he noted that there was a lot of focus on bedding, which is important, but issues such as light attenuation and primary producers need to be a clear focus for regulated rivers, lakes, reservoirs, estuaries, and oceans. Dr. Berry agreed and he said that clearly more is known about some systems as

opposed to others. He commented that charismatic systems have constituencies and he emphasized that intermediate turbidities and river systems, among other things need to be studied. He said that one aspect of the Chesapeake Bay study involving water clarity and sea grasses could be an effective approach to river systems as well.

A subcommittee member commented that a problem for EPA is lumping SABS together especially in terms of the effects on aquatic life since there is going to be some divergence. He further noted that while some presentations looked only at physical aspects, the biological aspects are key and it is important not to overlook important linkages.

In response to a question, Dr. Norton emphasized that while the Rosgen classification system was mentioned in his presentation, no decision has been made on a classification type or on using any classification system in a specific way. He further noted that all systems are open for consideration and he asked members to convey any suggestions they have on appropriate parameters.

Dr. Dale turned to a discussion of the consultation questions.

Consultation Question 1. Is it a scientifically valid premise that SABS in natural amounts (or at background levels) are beneficial to ecosystems and therefore water quality criteria should attempt to simulate natural regimes or background levels? If so, how should natural levels or background be determined?

A subcommittee member expressed emphatic support for determining a natural sediment regime, commenting that there is a natural curve in the reference condition and it is unrealistic to believe there is one set minimum number. Another member agreed and gave an example of some streams that have naturally high levels of turbidity to illustrate that such factors can vary substantially through different regions. Another subcommittee member concurred and mentioned gravel bed systems as another variable.

Another member supported consideration of background but he suggested that “simulate” was too confining of a word. Further, he said that it would be more effective to consider the designated use or the maximum attainable ecological level. Other members expressed support as well. A general discussion ensued. A subcommittee member noted that there may be some conflicts in life use versus drinking water or agricultural uses so there may be problems in looking only at designated use. A member commented that “natural regime” and “background level” mean two different things. The term “consider” was suggested as a substitute for “simulate.” A member expressed support for EPA determining the natural condition even if that condition is unattainable. He commented that the biological criteria arena believes it is valuable to determine a natural level and he said a group is working to define what is natural in biota. Other members indicated that

while it is important to address the issue of background levels, it should be done without expending an inordinate amount of effort or producing too much detail.

A subcommittee member supported the use of the word “regimes” in the consultation document because factors such as embeddedness are very dynamic in space and time and he said that there should be an emphasis not only on what to measure but also how, when, and where to measure. Mr. Swietlik noted that this point is touched upon in consultation question three and he said the staff would appreciate further discussion of the topic. EMAP protocols were discussed in this context. Mr. Norton said that the Bank Erosion Hazard Index (BEHI) may be helpful to address the issue of states getting consistently correct measurements. Bank height, root density, and surface protection, among other parameters, are elements of BEHI. He stressed the importance of field measures that “get up the bank a bit.” He mentioned that a number of studies fairly consistently find sediment comes from bank sources and not watershed (about half), but he emphasized that it is a generalization at this point. However, more attention must be paid to bank stability because land uses are not always problem, he said. A subcommittee member concurred that this is a valid premise but it is contingent on refining existing methods to capture the spatial and temporal aspects.

In response to concerns expressed by subcommittee members, a general discussion on the subject of total suspended solids (TSS) and turbidity measures followed. A subcommittee member stated that definitions in the consultation document need to be consistent, and she pointed out that fines not only are defined differently in various parts of the document but also are inconsistent with particle size definitions commonly used in the Southeast. Dr. Kaufmann commented on EMAP measurements and whether they can really be used to reflect whether or not a particular site is better or worse than in previous years. Different criteria may be needed for screening as opposed to determining specifics on a particular water body. The level of complexity of various measures was discussed in relation to the applicability to state monitoring programs and determining TMDLs. A subcommittee member described the difficulties of both states and the EPA with sediment TMDLs, but she emphasized the importance pointing out a pathway through which accurate monitoring can be achieved, e.g. relating base flow to biological effects. Another member agreed that relatively simple steps must ultimately be developed.

Dr. Dale summarized the sense of the subcommittee that good science is needed not only to determine overall objectives but also to determine an appropriate implementation strategy for monitoring programs.

In response to comments from a subcommittee member, Mr. Swietlik said that he envisions eventually using different indicators for different body types, stratified by different uses that need to be protected in an attainability analysis, e.g. for a drinking

water need, TSS would be used. The capability of the states to conduct these analyses must be considered, he said, which creates somewhat of a balancing act for the Agency.

A subcommittee member observed that while the staff presentations focused on relative strengths within individual programs, an overall analysis would have been more helpful to the subcommittee in recommending certain approaches. Another member suggested developing a case study from a specific region in which the various approaches would be used in the context of management decisions. Realistic parameters that can be measured in terms of "what it would take to bring system back" can be used to determine what kind of monitoring needs to be done.

Consultation Question 2. Can SABS criteria be stratified by water body type or by some other scheme? If by water body type, by what level of classification? Lotic and lacustrine? Rivers and streams, wetlands, lakes/reservoirs and estuaries/coastal areas? Others? If some other classification scheme is necessary, what type and how much resolution must it have?

A subcommittee member suggested that it is less valuable to treat systems by water body than by maximum ecological use and therefore he did not recommend stratifying by water body type. Another member suggested that a hydrogeomorphic approach is needed, and he referenced fine sediment storage areas. He noted that the Rosgen classification has strengths but is missing pieces. Others commented that the classifications suggested in the question are too rigid. In response to a question, Mr. Swietlik said that general applicability was the goal and formulating a table of specific criteria that must go with a certain water body is a plan being considered. There was further discussion of RBS and Bayesian approaches. A ratio with a denominator of a site-specific condition, where the ratio would not exceed a certain number, was suggested as an easier approach for states instead of a massive matrix of numbers in a book of regulations. At least one EPEC member suggested that RBS should be abandoned by EPA as a means of setting TSS criteria. The method for calculating RBS takes into account the sediment grain size (actually, the midpoint of the grain size as the "d50") and relates it to critical mobile diameter. This is dependent upon the water body, stream flow conditions, and other factors. The flaw with RBS is that it only has applicability to streams with riffle-runs (fast flowing water over gravel or cobble) and is related to the Riffle Stability Index, the member said. There is virtually no applicability of RBS to heavy sediment laden rivers to lakes, or to severely controlled rivers. An RBS will approach or exceed 1 in deep pools of impounded mid-west rivers (e.g. Missouri, Ohio, Mississippi, Tennessee, Fox) because the critical velocities are negated by the regulation of flow. The subcommittee member further noted that the states where RBS could potentially be applied are already well-advanced in their derivation of TSS- TMDLs. These include California, Idaho, Washington and Montana. RBS may have applicability to overall fisheries management -- but not as a method for setting national TSS criteria.

Consultation Question 6. Which of the EPA proposed criteria methods do you believe have the greatest potential? Why? Which ones should EPA not pursue further?

A subcommittee member endorsed the toxicological approach as distinguished from the others. Grain size and other characteristics of sediment size have an impact on biota. He said there are unique difficulties with uncertainties in recreating suspended solid conditions in the laboratory, particularly in reference to indigenous species. Another member stated that the toxicological approach has a lot of value but questioned how TMDLs would be calculated.

Another subcommittee member strongly opposed relying solely on the toxicological approach, noting that it may be useful in a complimentary sense or in terms of a specific species. The context very important but it is not practically replicable in the lab and will “bury you in data.” She offered written comments to the subcommittee, which Dr. Dale said would be made part of the record (See Attachment F). Another member agreed, commenting that a dose response approach can be adapted for specific species to provide information on a continuum of effects to determine strong linkages. Others agreed, with one member noting that the history of the approach shows that it can “lead you down wrong path” if relied on as a core theme rather than a tool. Agreement was expressed that it provides a line of evidence that should be incorporated and considered but not used as the base criteria. It would be perhaps the only mechanism for documenting what levels of sediments in the water column might affect primary phytoplankton production, zooplankton, larval pelagic fish, etc. Dr. Berry said that even if lab data is not used for every species, the approach may help determine which methods should be used for a particular system. A subcommittee member noted that the approach in fact embodies two concepts that should be separated in the future: (1) setting maximum ecological use for a water body (the discussion of the Chesapeake Bay process), and a true toxicological approach (dose, response). These are separate issues -- both important -- but not necessarily tied together.

A subcommittee member commented that the conditional probability approach is a good method that inherently includes variability. It was presented as a strictly associational method. He emphasized that the approach should not be used alone but it has virtues the others do not have. Another member supported some aspects of the approach as providing a robust estimate where there is a biotic response, but single factor ecology is a concern. An understanding of context would be a complement to that method he said. Other members commented on the multiple conditional probabilities that could be achieved.

There was general discussion of the RBS approach. A member commented that the approach has a lot of promise as a core supported by other approaches, especially if it gets imbedded in a classification that adjusts for likely erosional inputs and other factors. Another member said more of this type of information is needed on RBS and biota, but she noted that it is not a particularly sensitive indicator at intermediate levels. A subcommittee member expressed support for this more physically-based approach that is seeking an equilibrium view and attempts to account for roughness in channel stability. Concern was expressed with some of the estimates used in the approach (uncertainty in field determination of bank full depth, shear stress partitioning) and its applicability to stream types not tending toward equilibrium states. Dr. Kaufmann clarified that the approach is limited to flowing streams using bank full flow as an indicator. A question was raised about the usefulness of the approach in terms of lowland streams with naturally fine sediment. Dr. Kaufmann responded that the EMAP method for determining median size is not really appropriate in a completely lowland situation at particle sizes of 2 mm and down. In these cases, the stream is always competent to move those sediments so total stream power may be a better measure of supply and transport, he said. A ratio of one to one is not expected in an extremely lowland situation so use of a slope/area relationship or Rosgen based on flow competence would be more appropriate.

Support was expressed by several subcommittee members for use of the state reference condition approach in conjunction with other approaches. A member called it a grounding and central approach in which biotic criteria have been developed, and she emphasized the importance of identifying historic sediment levels and comparing what is observed with what is expected. Another member called it a good framework that everyone is accustomed to. A member suggested that EPA develop a means of collaboration between states for areas that are going to be responded to similarly to avoid the current problems with different standards for 301 and 305 reporting.

General comments about the fluvial geomorphic approach reflected an interest in seeing more detail. One member reflected that it could be very useful in targeting monitoring and diagnosing sediment impairment although he expressed concern about the distance between the criteria and the biological response as well as the practicality of developing suspended sediment relationships. Another member stated that the approach has good promise for regulated streams by looking at the ecological values that can be attained for rivers that are a net loss. Some members emphasized the importance of ensuring the biological effects are fully examined. It was noted that EPA must consider the disparate responses of different types of systems and provide information for both diagnostic and impairment needs.

Consultation Question 7. Can aspects of the different approaches described in the discussion paper be combined into a synthesis approach?

Member of the subcommittee recommended various means of synthesizing the approaches presented. One member suggested beginning with the state reference condition approach and adding the conditional probability approach supported by other material. Another member expressed concern that the reference condition approach may be appropriate to determine what the stream should be like naturally but not to determine how the stream should be managed, stating that the process for managing the system should be established. Each suggested approach could then be viewed as a tool to achieve the expectation for the water body. Others agreed and recommended that a statement about water bodies should come first, followed by the criteria. A member commented that a lot of water bodies had been “written off” to other uses rather than have protection of aquatic life systems as a priority and therefore it is important to recognize that the approaches may be informative in setting standards in the face of ecological variability. Monitoring, biogenetic effects, and re-evaluation procedures were also mentioned.

Dr. Dale expressed appreciation to subcommittee members their comments and discussion. She thanked the Mr. Swietlik and the EPA staff for their excellent work in summarizing the information presented and helping the subcommittee “pull pieces of puzzle together.”

The subcommittee adjourned for lunch at 12:05 p.m. The discussion resumed at 1:15 p.m.

Discussion with Agency Staff and Planning for Study on Ecological Risk Assessment (ERA)

Dr. Dale thanked EPA staff experts who had arrived to participate in the afternoon discussion of EPEC’s proposal for a self-initiated project to study ERA. She called on Dr. Michael Newman to present the subcommittee’s proposal.

Dr. Newman provided an overview of the proposed EPEC review of the EPA’s ERA process, summarized by slides (See Attachment G). EPEC proposes to provide a retrodictive appraisal of the overarching ERA approach applied by EPA to diverse situations. The risk assessment framework has been used in the United States and abroad since the early 1980's, so a wealth of experience now exists about risk assessment. Dr. Newman emphasized that the subcommittee will be evaluating the risk assessment process used by EPA, not the performance of EPA.

The subcommittee’s aim is to highlight advantages of the current approach and to identify areas that can be improved to make the ERA a more effective tool. Dr. Newman described the specific areas the subcommittee proposed to consider, including: 1) In what

types of decision-making has the ecological risk assessment approach been most effective? Least effective? 2) How effectively has the approach performed when regional scales are important to the decision maker? 3) How effectively has the approach performed when risk statements require integration of several stressors such as toxicants, habitat modification, and human harvesting? 4) How effectively are ecological knowledge and principles included in the approach? 5) Do the ecological risk assessment methods result in optimal decision making?

Dr. Newman reiterated that EPEC does not propose evaluating EPA's performance in ERA, but rather evaluating ERA as a tool. He asked for input from the EPA and EPEC to compile a list of additional considerations for the proposal.

Dr. Dale opened the discussion by turning to the Agency's experts for their comments on how ERA can be used differently to increase effectiveness.

Dr. Glenn Suter, National Center for Environmental Assessment (NCEA)/ORD, commented that there are not a lot of cases where the Agency took action on the basis of ERA so there is a lack of information. EPA has taken actions in several cases based on ecological parameters, mostly in Region 10. These have included

- The Eagle Harbor Superfund Site (East and West Operable Units),
- Commencement Bay Superfund Site – and, in particular, elements within the Hylebos Waterway,
- Early Actions within the Duwamish Superfund Site, and the Ward Cove Superfund Site in Ketchikan, Alaska.

ERA's were also important elements of both the Fox River and Hudson River Records of Decision. There are numerous other sites that have used the EPA paradigm for decision-making purposes, which would be useful in a retrospective. For example, a Wyoming state-lead RCRA Facilities Investigation at a former Standard Oil Refinery in Casper, WY used the paradigm to help formulate decisions about remediation. A complicated ERA that examined habitat issues, PAH contamination, and potential long-term selenium effects was conducted at that site and a no-further-action decision for the main part of what is known as Soda Lake was determined by the Wyoming DEQ.

Dr. Suter suggested that the subcommittee look at why ERA has not been more influential in decision-making. Dr. Newman agreed that it would be important to determine when the EPA has taken action on the basis of ERA and why they have not been used more often. A subcommittee member noted that EPA has taken action on human health risk assessments and she said that an analysis may provide an interesting

comparison. Mr. Bill Wood (EPA) stated that the cost-benefit effects in human health studies are quantified so it often comes down to the ability to assign a dollar value. Dr. Mark Sprenger, Office of Solid Waste and Emergency Response (OSWER), commented that there is little discussion of ecological risk because it is horribly documented. He also said that the difference between the impact of human health risk assessment and ERA is often a question of communication to the public e.g. spending \$20 million on human life or to save fish? It was noted that many of the decisions rendered by Region 10 were based upon risks to benthic organisms. There are numerous excellent examples of documented ecological risk decisions, but they are not collected in one place.

Dr. Edward Bender (ORD) referred to EPA program scrutiny by the Office of Management and Budget, and he suggested that their report of costs and benefits be reviewed. OW and the pesticides group develop their assessments in different ways. Overarching considerations of the Agency, which is being pushed by a number of things, must be considered when judging effectiveness, he said.

There was further discussion of why ERA does not play a larger role in the decision making process. Dr. Newman suggested that this issue should be at the top of the list of items reviewed by EPEC.

Dr. Michael Slimak (NCEA/ORD) commented that the risk assessment paradigm is regularly used in various EPA departments, and he suggested that the subcommittee solicit other groups within the Agency to determine how they use the paradigm. He provided examples of how the pesticides office uses risk assessments.

Dr. Slimak stated that it would be very difficult to differentiate how EPA has performed in ERA from evaluating ERA as a tool. He expressed his belief that an evaluation of ERA by the SAB will be viewed as an evaluation of the Agency. He expressed concern that the retrospective approach proposed by EPEC would result in the subcommittee "pointing out the error of our ways," which is not ideal from a regulatory standpoint. This process need not point out any errors. A very useful process would be to look at the paradigm, look at case studies and determine how assessment and measurement endpoints were developed, how Data Quality Objectives were included as part of the ERA, how data were treated and risks estimated, and then document the decisions that have been made. A review of this type would be an excellent reference for the Agency -- if not the risk community at large. The Agency is hopeful that the paradigm can be improved and is not suggesting that the subcommittee should not go forward with the proposal; however, it is important to be clear on how the process will be perceived, he said. Further, Dr. Slimak noted that there was concern about "opening a Pandora's box" in terms of potential litigation.

A lengthy discussion of this point ensued. Dr. Newman suggested that a full and open discussion with the experts is way to minimize concerns over perception, and he said the subcommittee feels an obligation to evaluate ERA as a tool. Dr. Randall Wenstel, Office of Science Policy (OSP)/ORD, recommended that the focus be on moving ahead by looking at what steps different EPA offices have taken in the last several years to improve the sophistication of risk assessments. Dr. Slimak said that advice for the future, especially concerning the concept of use in decision-making, would be welcome. Dr. Suter concurred, and he said that many ways can be found to do more sophisticated ERAs but this would be a waste of time and resources if changes do not result in ERAs becoming more influential. There was consensus that the retrospective aspect of the proposal be minimized and the term removed from the title of the EPEC proposal. Various wording was suggested.

The role of EPA, DOE, USDA Forest Service, and other agencies in ERA was discussed. EPA's leadership in the field was acknowledged, but a desire to consider all the differing approaches to ERA was expressed. A subcommittee member expressed his belief that something can be learned from the approaches by other agencies, but he said that EPEC's focus should be ERA in the context of advice to EPA so that the input does not become too general. The consensus was that the proposal should be subtitled "Optimizing the influence of ecological risk assessment in the EPA decision making process." Other suggestions for wording changes were made, which Dr. Newman agreed to incorporate in a draft and circulate to EPEC.

A subcommittee member asked the EPA staff to comment on whether or not the ERA study was something they wanted to do. There was discussion of the positive aspects of evaluating general areas of weakness in ERA programs and determining what can be done in the future to improve the paradigm and translate it to decision makers. It was noted that management decisions are shaped by many different tools and ERAs can be enhanced and the program impact optimized by researching the various programs. A subcommittee member commented that there are many fresh ideas coming from the European Union (EU) that should be considered.

Dr. Newman suggested that subcommittee members ask questions of the EPA experts in order to clarify the proposed study design.

A subcommittee member recommended that the focus be on success stories, and she asked the staff to provide information on these as well as sharing a little "dirty laundry." Establishing what is considered a success in taking a risk assessment approach to the decision-making arena will be an important step, she said. Dr. Springer concurred, noting that every successful ERA does not result in an action because sometimes risk is not present. Another EPEC member suggested developing a decision-making matrix for the ERA paradigm. One reason human health works so well is that there is a single

receptor, he said. Dr. Wenstel said he had a cross-reference document that may be helpful to developing the matrix, which he will send to Dr. Bachman. It was suggested that Agency decision makers be involved in the process as well. Dr. Suter referred to a successful water quality criteria program done in the past that may be helpful to the ERA review.

In response to a question, Dr. Dale indicated that subcommittee members are supposed to work through the DFO rather than contacting Agency staff directly. Concern was expressed that access to staff would be key as subcommittee members work on the proposal. An appropriate time frame for the study was discussed, which considered time limitations of both EPA staff and subcommittee members. A general time frame of 12 months was agreed upon, but distributing helpful materials as soon as possible was encouraged. Housekeeping details concerning FACA meetings, conference calls, and circulating information were discussed. Mr. Wood and Dr. Sprenger have background information that can be pulled together relatively quickly in an informal manner. Other suggestions were made, including contacting program offices not present (possibly through the ecological risk assessors), selecting a remedial project manager, and providing a list of decision makers at the division level or higher.

Dr. Newman commented that he had heard some new ideas for questions to be addressed, and he noted that the original questions needed to focus on the future rather than a retrospective. An EPEC member suggested that the first step for the subcommittee would be to refine the questions it is asking so briefing materials can be specific. Dr. Dale said the wording of the charge has to be such that when the task is undertaken, the charge is addressed. The goal is to be helpful to the scientists and to help the science move forward, she said. She concluded by thanking the participants for an informative, effective discussion. Dr. Dale also thanked Dr. Newman for his work in taking the lead on the proposal.

A break was taken at 2:30 p.m. Discussion resumed at 3:15 p.m.

Dr. Dale reported that the scheduled speaker had been delayed. At Dr. Dale's request, Dr. Gregory Biddinger provided an overview of the SAB Executive Committee meeting held in July. He noted that EPEC's self-initiated project proposals were among the top five ultimately recommended for further study.

Dr. Vu explained that 17 projects were presented to SAB Executive Committee. Since the ERA proposal was ranked so high, the staff was invited to discuss the issue with EPEC. She clarified that the next speaker, Dr. Peter Grevatt (OW) would not be specifically discussing the EPEC self-initiated project on water quality monitoring but rather he will address general research in the OW. As soon as a mutual agreement is defined, the proposal will be brought back to Executive Committee for further discussion.

She briefly described the status of other projects presented to the Executive Committee. Two tables were distributed by Dr. Vu indicating planned SAB projects and the proposed SAB schedule for the first quarter of FY 2004. She particularly emphasized the upcoming workshop on valuing the protection of ecological systems and services on October 27, which is open to EPEC members whose travel expenses would be reimbursed. Dr. Vu reviewed several additional SAB projects listed. The review of the Agency's report of the environment will be chaired by Dr. Dale. In response to a question, Dr. Vu explained that CR Ecological Modeling is a panel currently being formed. No chair has been named. She reminded the subcommittee that SAB members are welcome to attend all committee meetings and she has a travel budget to cover expenses. Dr. Vu went on to describe some projects of particular interest to EPEC.

Dr. Dale asked Dr. Vu to review plans for the upcoming SAB annual meeting in December. Dr. Vu explained that December 10 would provide a half-day for standing committees to meet, December 11 and 12 would consist of meetings with both new and old committee members. She outlined some emerging topics that would be discussed. On the evening of December 11, the EPA Administrator will meet all SAB members.

Agency Briefing on Water-Quality Monitoring Initiative

Dr. Grevatt offered his apologies for his delayed arrival before presenting a report on the Agency's water quality activities, supported by slides (See Attachment H). He listed recent reports providing critiques of water monitoring programs, noting that the Agency lacks the data to support basic decisions that must be made under the Clean Water Act (CWA). Questions must be answered at both the state and federal level, he said. More monitoring and data is a clear need. Current monitoring and assessments are limited; focusing on targeted monitoring designs at "the end of the pipe," that is, what is coming out into pollution-choked rivers.

Now, 30 years into the implementation of the CWA, there is only a small handful of rivers where monitoring is taking place (19%). Ultimately, the Agency cannot answer whether water quality is getting better or worse because the data is not available to determine the answer.

Dr. Grevatt stated that partnerships are being used to great advantage. A combination of the best monitoring tools is used so the most comprehensive answers on the state of the country's waters can be determined. Obviously there is not enough money to do everything the Agency wants to do but it is working to achieve the best results, he said.

Dr. Grevatt noted that the President has talked about three principles for federal program management: citizen-centered, results-oriented, and market-based. Improved monitoring can meet these objectives, he said.

There is program weakness in the area of characterizing what is happening with water quality. Access to comprehensive data across programs is needed. Several entities are doing water quality monitoring so it is difficult hard to coordinate the different methods, he said.

Dr. Grevatt outlined four strategic themes for improving water quality monitoring:

1. Strengthen state monitoring programs. Functional, not fancy, programs are needed. State-specific water monitoring strategies are a top priority, and the EPA is looking comprehensively at what monitoring programs need to do.
2. Multiple monitoring tools. The full range of decisions for all water body types must be used.
3. Expand accessibility of data. Comparability of methods and reporting are encouraged, although many states report that their data is housed on paper so access is difficult.
4. Promote partnerships. Municipal and other partnerships and collaborations will maximize monitoring resources.

In terms of probability-based tools, innovative programs such as remote sensors are being explored, as well as the EMAP probability based program, landscape models and others, Dr. Grevatt said. A graph indicating states that have adopted probability-based designs was provided. Targeted monitoring designs are typically used by states for TMDLs. Dr. Grevatt commented that Dr. Norton has the lead on many innovative approaches such as remote sensing, which is a major growth area.

Dr. Grevatt stated that use of the USGS data system is a new innovation that is creating a lot of excitement. By the end of the year, individuals will be able to log on to a computer and get a comprehensive view of data at one site. In response to comments, Dr. Grevatt said that obviously there are data gaps in waterways so presently there is not a full comprehensive view but this is envisioned for the future. He referred the subcommittee to the following URL: www.epa.gov/waters.

Dr. Grevatt discussed the key partners in water quality monitoring, and he said that states and tribes do the vast majority of monitoring. Sharing information through partnerships such as that with USGS are key to moving forward with new projects, he said. Noting that October 18 is national water monitoring day, Dr. Grevatt stated that these efforts serve to raise public awareness. Australia has gotten such good data from similar programs that they are able to make official use of the information gathered by volunteers.

In conclusion, Dr. Grevatt emphasized the importance of being able to quantify the effectiveness of water quality programs and provide information to the public and Congress about the state of waters in the United States.

Several EPEC members addressed questions to Dr. Grevatt. One member asked if the USDA Forest Service is included in the water monitoring partnerships, and he went on to describe his involvement with a monitoring program in which they participate. He expressed interest in two major issues: 1) Are probabilistic monitoring designs encouraged or required; and 2) What is being done to encourage data compatibility?

Dr. Grevatt responded that states cannot be required to adopt probabilistic methods but they are encouraged to do so, and are also strongly encouraged to adopt compatible methods so data can be compared from state to state. One problem is that many states believe their methods are adequate for their own use and do not feel compelled to change for purposes of compatibility. It requires an education and communication process by the Agency to illustrate the value of characterizing national water quality.

A member commented that states are spending a lot of money on monitoring and she suggested that the Agency emphasize targeting money spent in a more efficient manner rather than spending more money. Dr. Grevatt concurred that a small investment would make a big difference but it cannot be said that changing programs would not cost states more money. Another member stated that it is not just a matter of money but also continuity of comparison data is a problem if monitoring methods within a given state are changed.

Probability-based program designs were discussed. One member noted that there are many concerns in the community about probability-based program designs. She suggested as an alternative using a design where the number of sites is expanded but the same sites are studied repeatedly. Dr. Grevatt responded that the costs of such a program would be prohibitive, and he said that the Agency does not view probabilistic programs as the “be all and end all” but rather as a necessary component to achieving a comprehensive national view of water quality. A subcommittee member pointed out that nationwide the system is wanting while the states have a mandate to ensure certain things improve.

Another subcommittee member commented that there is a paradox between monitoring with very expensive programs versus using volunteers, and asked if the Agency plans to view data from volunteers as more acceptable in order to meet standards. Dr. Grevatt responded that there are plans to incorporate methods to ensure data quality so that results of volunteer monitoring efforts may be used in the future.

In response to a question, Dr. Grevatt said that the Agency is most interested in comments from EPEC on questions of how to combine various monitoring tools and on the most effective tools to use. A subcommittee member asked if a single document exists that explains the objectives and specific questions to be answered. Dr. Grevatt agreed that it is important to answer the question of what is to be accomplished in

specific terms, in addition to the basic recognition that monitoring has to focus resources in support of the TMDL program. He expressed a willingness to respond to specific follow-up questions.

A discussion ensued of the most appropriate and effective means for EPEC to provide assistance to OW. There was consensus that the 2-year guidance document being sent to the states for comment may be the best vehicle for providing input. Members emphasized that EPEC wants to be of substantial assistance to OW in this entire process by providing expertise to help in stratification and targeting issues, among others.

Dr. Grevatt expressed his sincere appreciation for the excellent points made and input provided by EPEC. The Agency is hopeful for progress, he said.

Dr. Dale thanked Dr. Grevatt for his presentation and indicated that the panel may invite him back to a future meeting. She then moved on to a discussion of workable dates for upcoming subcommittee meetings. Several members indicated that they have conflicts with the December SAB meetings. Dr. Dale asked subcommittee members to check their calendars so that the next meeting date can be established. She also asked that Dr. Newman turn around the proposal re-write fairly quickly so that it would be available for the next Executive Committee meeting.

The water quality monitoring initiative was briefly discussed in terms of whether or not panel input would be useful given the state of the program. Dr. Meyer and Dr. Hawkins agreed to do some research and report back to the subcommittee by the end of October.

Dr. Bachman reviewed the procedure for subcommittee reviews and FACA meetings. It was agreed that dates in February and September would be considered for upcoming EPEC meetings.

Dr. Dale thanked Dr. Bachman on behalf of EPEC for all his work in assembling the panel of experts.

Dr. Bachman adjourned the meeting at 5:30 p.m.

Respectfully Submitted:

L. Joseph Bachman, Ph.D.
Designated Federal Officer

Certified as True:

Virginia H. Dale, Ph.D.
Chair

NOTE AND DISCLAIMER: The minutes of this public meeting reflect diverse ideas and suggestions offered by the Panel members during the course of deliberations within the meeting. Such ideas, suggestions, and deliberations do not necessarily reflect definitive consensus advice from the panel members. The reader is cautioned to not rely on the minutes to represent final, approved, consensus advice and recommendations offered to the Agency. Such advice and recommendations may be found in the final advisories, commentaries, letters, or reports prepared and transmitted to the EPA Administrator following the public meetings.

Attachments

Attachment A:	Roster
Attachment B:	Federal Register Notice
Attachment C:	Meeting Agenda
Attachment D:	“Developing Water Quality Criteria for Suspended and Bedded Sediments (SABS) – Potential Approaches” Consultation Document
Attachment E:	“Developing Water Quality Criteria for Suspended and Bedded Sediments (SABS) – Potential Approaches” Slide Presentation
Attachment F:	Dr. Meyer’s Comments on the Toxicological Approach
Attachment G:	“Study on Ecological Risk Assessment” Slide Presentation
Attachment H:	“Improving Water Quality Monitoring” Slide Presentation